

長期供用されたコンクリート水路の中性化に関する研究

Study on neutralization of concrete canal supplied for a long period

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1. Introduction

Neutralization is one of the most common concrete deterioration from of old. In general, phenolphthalein ethanol (call PP here after) method is applied for the evaluation of neutralization after shaving off or digging from surface of concrete. Coefficient of neutralization velocity is calculated from neutralization depth data gotten from above test. Moreover, the surplus life length against neutralization is considered to be able to predict.

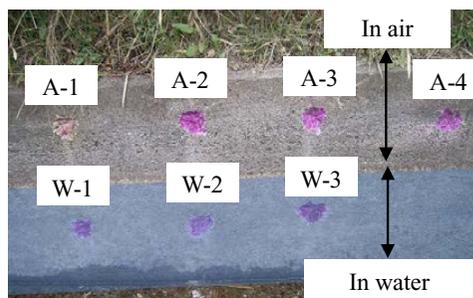
However, our previous research have clarified that PP method had limits on application while the evaluation couldn't preserve enough precision¹⁾. Also it was revealed that concrete canal that contact with water frequently had different progress of neutralization depends on the environmental conditions; in the water or in the air.

In this research, actual concrete canal supplied for long period were targeted and neutralization depths were measured in detail by means of PP method. The difference of environmental condition was focused experimentally. Moreover, application method was also conducted using three continuous spans of concrete canal in order to examine how to decide a measure of central tendency.

2. Experimental program

2.1 Summary of concrete canal

Open concrete canal located at the center of Kochi Pref. was focused in this study. Structure of this canal is the reinforced concrete, placed on-site 42 years ago. Three consecutive spans were chosen;



Pic.1 A general condition of shaving test

the length of each span was almost 7m under the agreement of land improvement district which has jurisdiction of canal system.

2.2 Field investigation method

Shaving method was applied for the evaluation of neutralization depths. Shaving the surface of canal about 50mm, shaved hole was cleaned completely with a blower. 1.0% concentrations of PP solution was sprayed uniformly and waited until coloration development was stable. The boundary between coloration and non-coloration was measured as neutralization depth using depth gage.

A general condition of shaving test was shown in Pic.1 The number of shaving test in each span was totally 7 positions; 4 positions were at the part in air, and 3 positions were at the part in water.

3. Results and discussions

3.1 Difference of neutralization depth in same member

All the results of neutralization depths and its standard deviations were divided into the difference

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of environmental conditions, the part in the air and water, and shown in Fig.1. Neutralization depths in water of all spans have not so much difference between all the positions in each span. Standard deviations of all values also didn't have so much difference. Overall, it was confirmed that the value in water was stable.

On the other hand, it wasn't confirmed the identical values nor tendency in each span. There were no big differences between each position in air of Span I and II, neutralization depths were almost 4mm and 5mm, respectively. However, the depths in air of Span III had big difference even in the same member (span), the disparity was more than 5mm. Standard deviations in air of Span III also indicated the same tendency comparing with that of Span I and II. Thus, measurement of neutralization depth would generate such variation even in the same member. Therefore, it was considered that evaluation procedure should be necessary to decide mentioned with such variations.

3.2 Influence on environmental conditions to neutralization depth

Comparing the neutralization depth of the part in air with that of the part in water, the depths in air were equal to or larger than that in water comparatively. In general, environmental condition gives large affect to the neutralization velocity, and neutralization velocity in air conditions was larger than that in water. Our previous studies have clarified the necessity of surface condition when measure the neutralization depth; the part in water commonly generated the abrasion, one kind of peculiar deterioration generated in agricultural hydraulic concrete structure. When the thickness of disappeared mortar was added to the measured neutralization depth, the difference due to the environmental condition would be dissolved. Anyway further investigations are necessary for the correct evaluation of neutralization in the future.

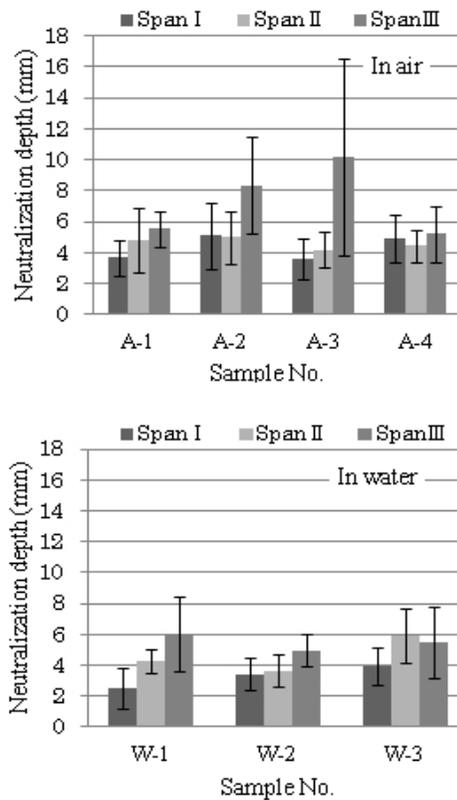


Fig.1 Comparison of neutralization depth between 3 consecutive spans

4. Conclusions

- 1) Span I and II showed a similar neutralization depth in the same member, but Span III had big difference at the air part of canal.
- 2) Standard deviations showed a similar tendency within the 3 spans.
- 3) Comparing the neutralization depth in air and in water of concrete canal, both values of in water were smaller than in air.

Acknowledgement

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References

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